CLAIMS

We claim:

1. A molybdenum-copper composite powder comprising individual finite particles each having a copper phase and a molybdenum phase wherein the molybdenum phase substantially encapsulates the copper phase.

2. The composite powder of claim 1 wherein the individual particles have a size of about 0.5 μm to about 1.5 μm.

3. The composite powder of claim 2 wherein the composite powder comprises agglomerates of the finite particles.

4. The composite powder of claim 3 wherein the agglomerates have a size of about 15 μm to about 25 μm.

5. The composite powder of claim 1 wherein the powder contains from about 2 wt. % to about 40 wt.% copper.

6. A molybdenum-copper composite powder comprising individual finite particles each having a sintered molybdenum network wherein the voids in the network are filled with copper.

7. The composite powder of claim 6 wherein the powder has the color of unalloyed molybdenum powder.

8. The composite powder of claim 6 wherein the individual finite particles have a size of about 0.5 μm to about 1.5 μm.

9. The composite powder of claim 6 wherein the powder contains from about 2 wt. % to about 40 wt.% copper.

10. A method of making a $CuMoO_4$-based composite oxide powder comprising:

(a) forming a mixture of a molybdenum oxide and a copper oxide, the molybdenum oxide being selected from ammonium dimolybdate, ammonium paramolybdate, or molybdenum dioxide; and

(b) firing the mixture at a temperature and for a time sufficient to form the $CuMoO_4$-based composite oxide.

11. The method of claim 10 wherein a stoichiometric excess of up to 4 wt.% copper oxide is added to the mixture.

12. The method of claim 10 wherein the copper oxide is selected from cuprous oxide or cupric oxide.

13. The method of claim 10 wherein the $CuMoO_4$-based composite oxide has a general formula of $CuMoO_4 + xMoO_3$ where x is from about 29 to 0.

14. The method of claim 10 wherein the mixture is fired at a temperature from about 650°C to about 750°C for about 5 hours.

15. The method of claim 14 wherein a stoichiometric excess of up to 4 wt.% copper oxide is added to the mixture.

16. The method of claim 15 wherein the copper oxide is selected from cuprous oxide or cupric oxide.

17. The method of claim 14 wherein the $CuMoO_4$-based composite oxide has a general formula of $CuMoO_4 + xMoO_3$ where x is from about 29 to 0.

18. A method of making a Mo-Cu composite powder comprising:

(a) reducing a $CuMoO_4$-based composite oxide powder in a first stage to form an intimate mixture of metallic copper and molybdenum oxides without the formation of low-melting-point cuprous molybdate phases; and

(b) reducing the intimate mixture in a second stage at a temperature and for a time sufficient to reduce the molybdenum oxides to molybdenum metal.

19. The method of claim 18 wherein the first stage reduction is performed at a temperature from about 250°C to about 400°C.

20. The method of claim 19 wherein the second stage reduction is performed at a temperature from about 700°C to about 950°C.

21. The method of claim 18 wherein the low-melting-point cuprous molybdate phases are $Cu_6Mo_4O_{15}$ and $Cu_2Mo_3O_{10}$.

22. The method of claim 18 wherein the Mo-Cu composite powder is passivated in nitrogen after the second stage reduction.

23. A method for making a Mo-Cu pseudoalloy comprising:

(a) consolidating a Mo-Cu composite powder to form a compact, the Mo-Cu composite powder having a copper content from about 2 wt.% to about 40 wt.% and comprising individual finite particles each having a copper phase and a molybdenum

phase wherein the molybdenum phase substantially encapsulates the copper phase;

(b) sintering the compact in a first sintering stage at a temperature from about 1030°C to about 1050°C to form a molybdenum skeleton;

(c) sintering the compact in a second sintering stage at a temperature from about 1050°C to about 1080°C for a compact made from a composite powder having a copper content of about 26 wt.% to about 40 wt.%, or at a temperature from about 1085°C to about 1400°C for a compact made from a composite powder having a copper content of about 2 wt.% to about 25 wt.%.

24. The method of claim 23 wherein the Mo-Cu composite powder is combined with a binder and/or lubricant prior to consolidation.

25. The method of claim 24 wherein the compact is heated at a temperature from about 200°C to about 450°C before sintering to remove the binder and/or lubricant.

26. The method of claim 23 wherein the compact is heated at a temperature from about 930°C to about 960°C to remove oxygen before sintering.

27. The method of claim 23 wherein the Mo-Cu pseudoalloy has a density of about 97% to about 99% theoretical density.

28. The method of claim 27 wherein the Mo-Cu pseudoalloy has a microstructure having molybdenum grains in the range of about 1 μm to about 5 μm and copper pools in the range of about 2 μm to about 15 μm.